Rivers and Streams

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Iowa Stream Fish Species of Greatest Conservation Need: Using IAGAP and REMAP Products to Refine Prioritization and Guide Assessment

Freshwater ecosystems are among the most endangered ecosystems in the world, and many freshwater species are consequently highly threatened and vulnerable to extinction. In Iowa extensive agricultural practices and other anthropogenic disturbances (e.g., damns, channelization, introduced species) are primary contributors to stream ecosystem degradation. Stream fishes are among Iowa's most imperiled animals, and a realistic and effective approach to conservation is needed. The Iowa Wildlife Action Plan identified 68 fish species of greatest conservation need (SGCN). Many fish SGCN reside in wadeable streams across Iowa. Before we can address streams and watersheds as potential conservation sites, we must understand the distribution and habitat requirements of the priority fish species of greatest conservation need. Predictive models could contribute to this goal and may be a useful tool for identifying areas for conservation. In 2001 the Iowa Aquatic Gap Analysis Project (IAGAP) was initiated and used the Iowa Stream Fish Database and GIS-derived landscape-scale variables (e.g., flow, stream size, gradient, temperature, elevation, etc.) to predict fish species distributions. The potential value of the IAGAP models is substantial, but first they must be validated with an independent data set. The objectives of this project are to (1) refine Iowa's prioritization of stream fish SGCN, (2) test the potential of the IAGAP models for predicting the occurrence of focal fish SGCN in Iowa streams, and (3) better understand the occurrence and habitat associations of priority fish SGCN in wadeable streams.

During the 2009 and 2010 field seasons 52,871 fish were sampled from 86 wadeable stream reaches. Twenty-one of the 72 species sampled were SGCN, including seven focal species (i.e., banded darter, blackside darter, Ozark minnow, redfin shiner, slenderhead darter, southern redbelly dace, tadpole madtom). Redfin shiner, tadpole madtom, blackside darter, and slenderhead darter frequencies of occurrence where previously documented were less than 40% suggesting declines in distribution. Iowa Aquatic Gap Analysis Project model performance was evaluated using Cohen's Kappa value which measures the proportion of all presences or absences predicted correctly after accounting for chance. Kappa values less than zero indicate model performance no better than random chance whereas a value of one indicates perfect model performance. Cohen's Kappa values for focal species models varied from 0.0 (tadpole madtom) to 0.42 (banded darter), and values were only significantly greater than zero for banded darter and southern redbelly dace. The results of this study suggest IAGAP models may not be an adequate tool for predicting the distribution of Iowa stream fish SGCN. Therefore, future goals are to develop improved species occurrence models by incorporating landscape-scale habitat, local-scale habitat (e.g., in-stream), and biotic data. Furthermore, important habitat associations and macrohabitat (i.e., run, riffle, pool) preference will be identified for select fish SGCN.